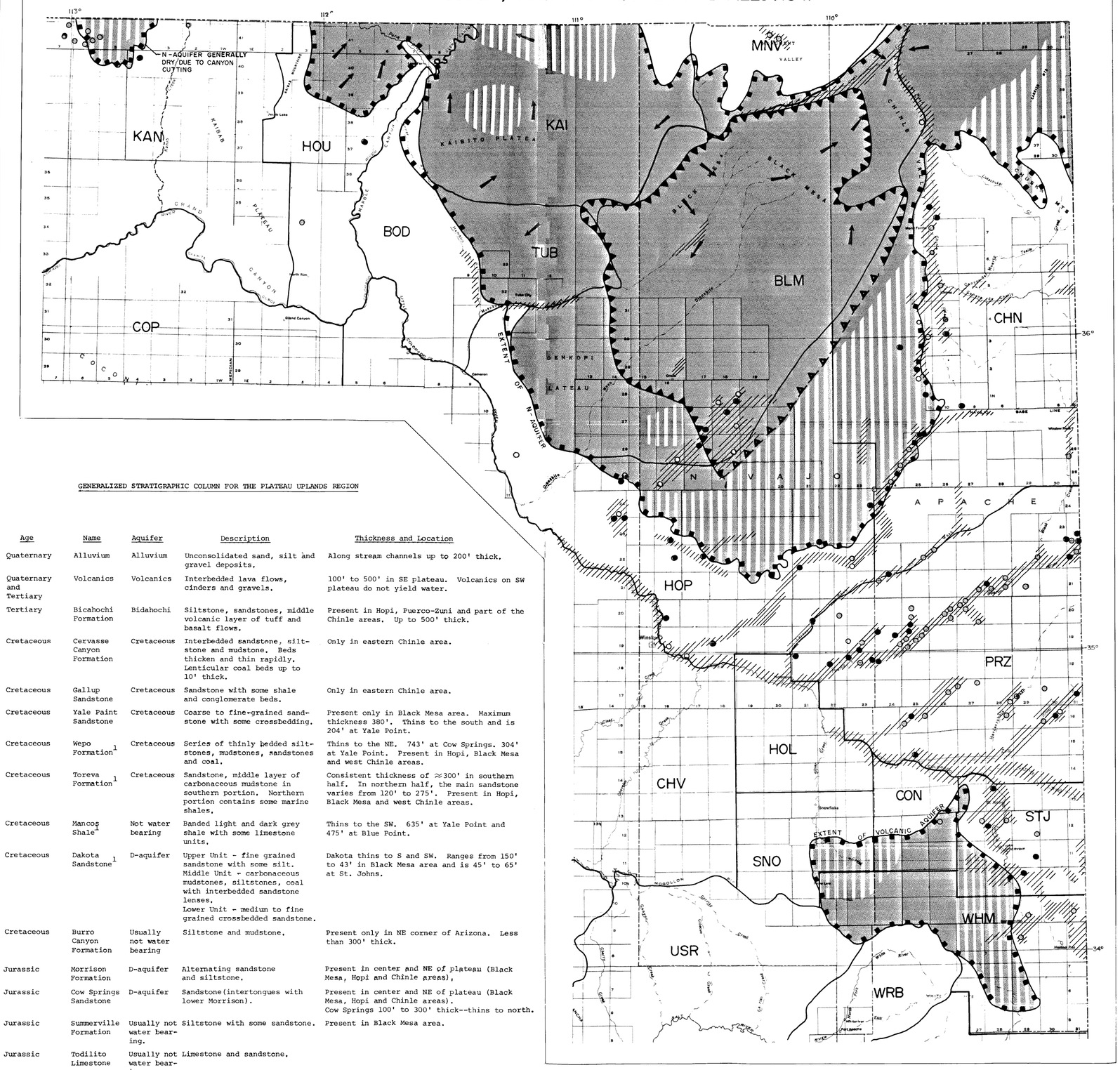
PLATE 2a

N - AQUIFER, VOLCANIC AQUIFER AND ALLUVIUM



GENERALIZED STRATIGRAPHIC COLUMN FOR THE PLATEAU UPLANDS REGION

Age	Name	Aquifer	Description	Thickness and Location
Quaternary	Alluvium	Alluvium	Unconsolidated sand, silt and gravel deposits.	Along stream channels up to 200' thick.
Quaternary and Tertiary	Volcanics	Volcanics	Interbedded lava flows, cinders and gravels.	100' to 500' in SE plateau. Volcanics on SW plateau do not yield water.
Tertiary	Bicahochi Formation	Bidahochi	Siltstone, sandstones, middle volcanic layer of tuff and basalt flows.	Present in Hopi, Puerco-Zuni and part of the Chinle areas. Up to 500' thick.
Cretaceous	Cervasse Canyon Formation	Cretaceous	Interbedded sandstone, siltstone and mudstone. Beds thicken and thin rapidly. Lenticular coal beds up to 10' thick.	Only in eastern Chinle area.
Cretaceous	Gallup Sandstone	Cretaceous	Sandstone with some shale and conglomerate beds.	Only in eastern Chinle area.
Cretaceous	Yale Paint Sandstone	Cretaceous	Coarse to fine-grained sandstone with some crossbedding.	Present only in Black Mesa area. Maximum thickness 380'. Thins to the south and is 204' at Yale Point.
Cretaceous	Wepo Formation[1]	Cretaceous	Series of thinly bedded siltstones, mudstones, sandstones and coal.	Thins to the NE. 743' at Cow Springs. 304' at Yale Point. Present in Hopi, Black Mesa and west Chinle areas.
Cretaceous	Toreva Formation[1]	Cretaceous	Sandstone, middle layer of carbonaceous mudstone in southern portion. Northern portion contains some marine shales.	Consistent thickness of ≈300' in southern half. In northern half, the main sandstone varies from 120' to 275'. Present in Hopi, Black Mesa and west Chinle areas.
Cretaceous	Mancos Shale[1]	Not water bearing	Banded light and dark grey shale with some limestone units.	Thins to the SW. 635' at Yale Point and 475' at Blue Point.
Cretaceous	Dakota Sandstone[1]	D-aquifer	Upper Unit - fine grained sandstone with some silt. Middle Unit - carbonaceous mudstones, siltstones, coal with interbedded sandstone lenses. Lower Unit - medium to fine grained crossbedded sandstone.	Dakota thins to S and SW. Ranges from 150' to 43' in Black Mesa area and is 45' to 65' at St. Johns.
Cretaceous	Burro Canyon Formation	Usually not water bearing	Siltstone and mudstone.	Present only in NE corner of Arizona. Less than 300' thick.
Jurassic	Morrison Formation	D-aquifer	Alternating sandstone and siltstone.	Present in center and NE of plateau (Black Mesa, Hopi and Chinle areas).
Jurassic	Cow Springs Sandstone	D-aquifer	Sandstone (intertongues with lower Morrison).	Present in center and NE of plateau (Black Mesa, Hopi and Chinle areas). Cow Springs 100' to 300' thick--thins to north.
Jurassic	Summerville Formation	Usually not water bearing.	Siltstone with some sandstone.	Present in Black Mesa area.
Jurassic	Todilito Limestone	Usually not water bearing	Limestone and sandstone.	
Jurassic	Entrada Sandstone	D-aquifer	Sandstone with some siltstone.	Mainly in Black Mesa area, but also parts of Kaibito, Tuba City, Chinle, Hopi and House Rock areas. Varies from 50' to 350'.
Jurassic	Carmel Formation	Usually not water bearing	Siltstone with some sandstone.	Mainly in Black Mesa area, but also parts of Kaibito, Tuba City, Chinle, Hopi and House Rock area.
Jurassic and Triassic (?)	Navajo Sandstone	N-aquifer	Even-grained sandstone with large crossbeds.	Present in Black Mesa, Kaibito, Tuba City, Hopi and northern part of Kanab and House Rock areas. Thins to the SE.
Triassic (?)	Kayenta Formation	N-aquifer	Siltstone to silty sandstone.	Same as above.
Triassic	Moenave Formation	N-aquifer	Silty sandstone to sandy siltstone.	Present in Black Mesa, Kaibito, Tuba City, Hopi and parts of Chinle, Kanab and House Rock areas. Thins to the SE.
Triassic	Wingate Sandstone:			
	-Lukachukai Mb.	N-aquifer	Sandstone with large crossbeds.	Thins to the NW. Present in Black Mesa, Kaibito, Tuba City, Hopi and Chinle areas.
	-Rock Point Mb.	Usually does not yield water to wells	Siltstone and silty sandstone.	Present in Hopi area. Thins to SE.
Triassic	Chinle Formation:			
	-Owl Rock Mb. -Petrified Forest Mb. -Monitor Butte Mb.	Generally do not yield water to wells	Alternating shaly and sandstone beds, Coarser in southeast.	500' to 1,000' thick.
	-Shinarump Mb.	C-aquifer in Chinle area	Sandstone and conglomerate.	Average thickness ≈ 75' and is up to 200' thick, Channel filling deposit of random and limited extent over most of plateau.
Triassic	Moenkopi	yields small amounts of water	Reddish brown siltstone with some sandstone. Coarser in southeast.	Present over most of Eastern Plateau. Eroded along Little Colorado River and Western Plateau. Up to 400' thick, average thickness in Monument Valley and Black Mesa areas ≈200'.
Permian	Kaibab Limestone	C-aquifer	Light grey limestone. Upper portion is thin-bedded dolomitic limestone. Lower portion contains more sandstone and is thicker bedded. It is extensively fractured.	>400' thick in Grand Canyon. Thins to the east and pinches out just west of Joseph City.
Permian	Toroweap	C-aquifer	Pale colored sandstone containing some siltstone beds.	Present in western half of Plateau area and is up to 100' thick.
Permian	Coconino Sandstone -DeChelly Sandstone Mb. of Cutler Formation	C-aquifer	Very fine to medium grained, well sorted sandstone with conspicuous cross-bedding.	Laterally equivalent to the DeChelly Sandstone of the Chinle area. Max. thickness = 900' in SW, thins to north and east. 450' near Holbrook. Wedges out near Arizona-Utah border.
Permian	Hermit Shale	not water bearing	Red sandy shale and fine-grained sandstone.	
Permian and Pennsylvanian	Supai Formation	Upper part= Part of C-aquifer	Red sandstone containing thick evaporite deposits in SE area of Plateau in upper half. Lower Supai is siltstone with some sandstone beds.	100 to 200' thick in Oak Creek Canyon. Thickness to NE. Up to 600' thick in Black Mesa area. Present over entire Plateau area.
Pennsylvanian	Naco Formation	Naco	Limestone.	Present in SE part of Verde Valley along Mogollon Rim.
Mississippian	Redwall Limestone	Redwall	Thick bedded limestone containing some chert beds, many solution channels and cavities. Source of many springs along Colorado and Little Colorado Rivers.	600' thick in Grand Canyon. Thins to the southeast and is not recognized east of Holbrook.
Devonian	Martin Limestone	not water bearing except near faults	Dolomitic limestone.	400-500' thick. Present along Mogollon Rim, under Black Mesa and in West Grand Canyon.

CONT. GENERALIZED STRATIGRAPHIC COLUMN FOR THE PLATEAU UPLANDS REGION

Cambrian	Muav Limestone	yields some water to springs	Impure thin-bedded bluish-grey limestone.	>400' thick in West Plateau; thins to SE.
Cambrian	Bright Angel	not water bearing	Green, micaceous, sandy shale, and purplish brown sandstone.	324' thick in middle of Grand Canyon; thins to the east.
Cambrian	Tapeats Sandstone	not generally water bearing some springs	Poorly sorted sandstone with feldspar.	250-300' thick near confluence of Little Colorado and Colorado Rivers; thins to SE.

[1] Cretaceous undifferentiated in SE parts of plateau (St. Johns, Concho and White Mountains areas).

TOTAL DISSOLVED SOLIDS (mg/l)

- less than 1,000
- 1,000 to 3,000
- 3,000 to 5,000
- 5,000 to 10,000
- quality inferred; limited data (color indicates level of TDS)
- no information available

SYMBOLS

- Basin or area boundary
- Generalized direction of ground-water movement
- Aquifer boundary; dashed where assumed
- confined / unconfined — Boundary between confined and unconfined conditions; dashed and open where assumed
- Approximate area of water-bearing stream alluvium
- Location of well in stream alluvium; color indicates level of TDS

PLATE 2

TOTAL DISSOLVED SOLIDS CONTENT OF AQUIFERS OF THE PLATEAU UPLANDS

(Excludes the C-Aquifer, shown on Plate I)

Prepared by the Department of Water Resources in cooperation with the Arizona Department of Health Services
under a grant from the U.S. Environmental Protection Agency

10 0 10 20 30 40 Miles
10 0 10 20 30 40 50 Kilometers

PLATE 2b-BIDAHOCHI, CRETACEOUS AND TERTIARY AQUIFERS

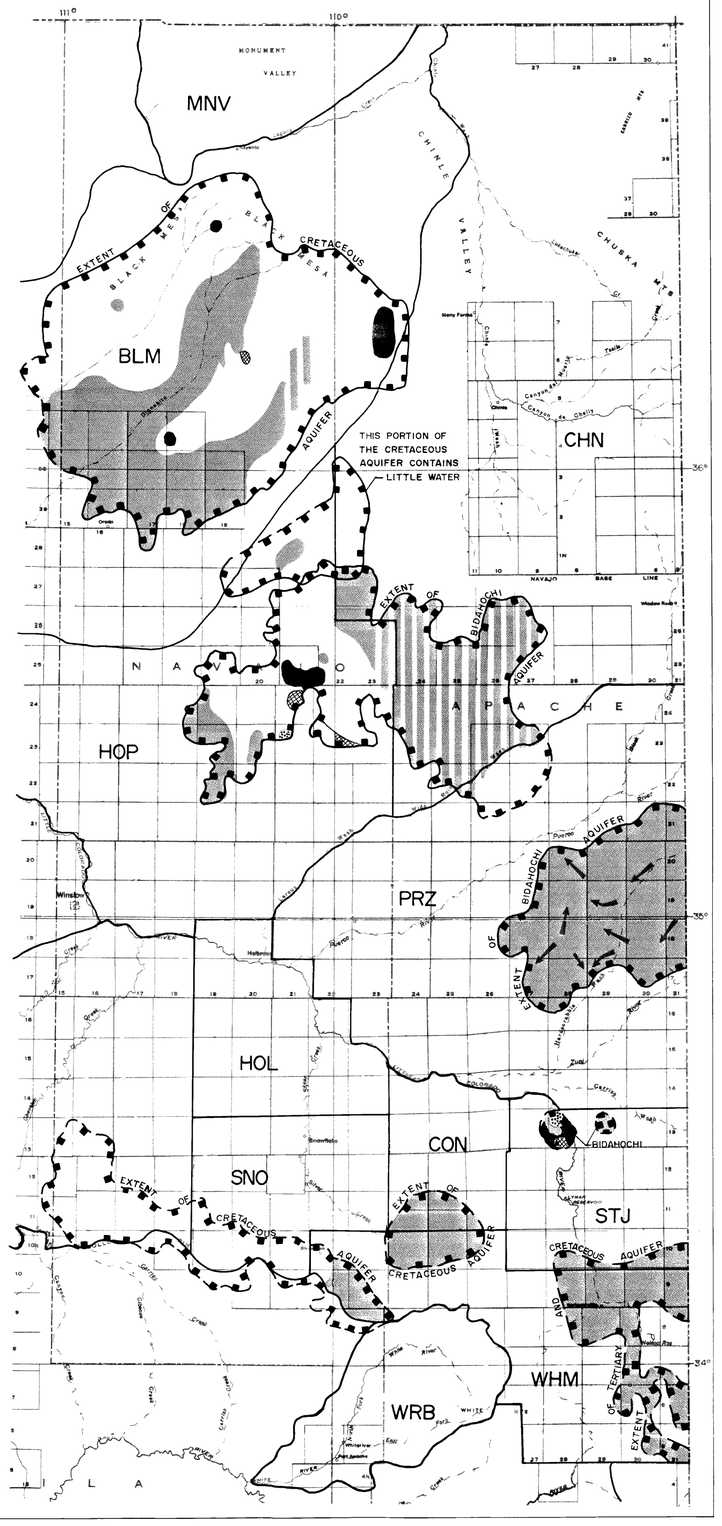
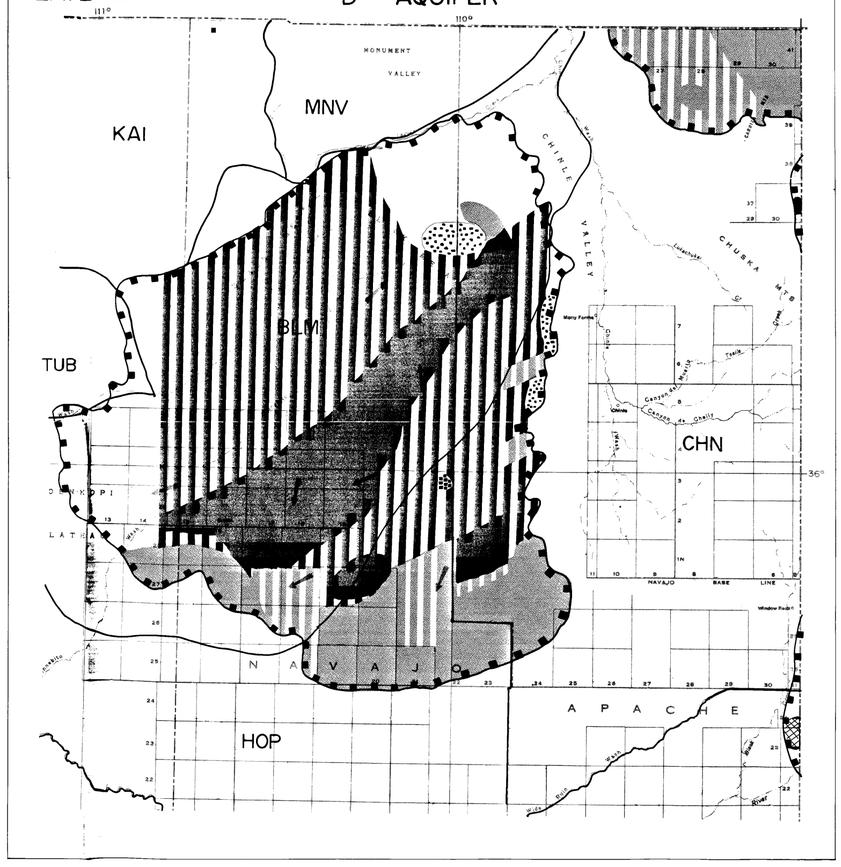


PLATE 2c

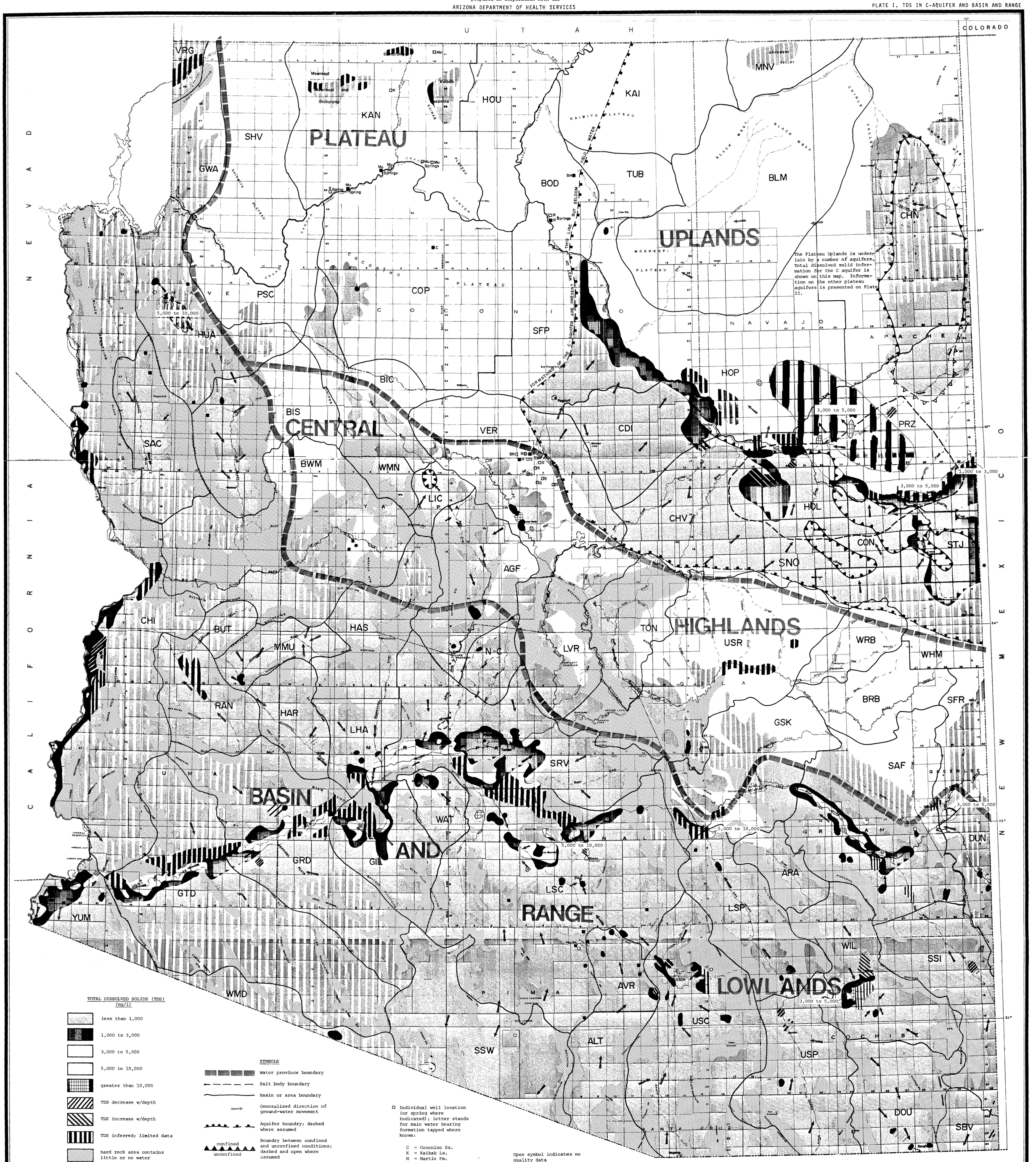
D — AQUIFER



Compiled by Debra Daniel

ARIZONA DEPARTMENT OF WATER RESOURCES
prepared in cooperation with the
ARIZONA DEPARTMENT OF HEALTH SERVICES

D.W.R. HYDROLOGIC MAP SERIES NO. 2
PLATE I, TDS IN C-AQUIFER AND BASIN AND RANGE



The Plateau Uplands is underlain by a number of aquifers. Total dissolved solid information for the C aquifer is shown on this map. Information on the other plateau aquifers is presented on Plate II.

TOTAL DISSOLVED SOLIDS (TDS) (mg/l)

- less than 1,000
- 1,000 to 3,000
- 3,000 to 5,000
- 5,000 to 10,000
- greater than 10,000
- TDS decrease w/depth
- TDS increase w/depth
- TDS inferred; limited data
- hard rock area contains little or no water
- no information available

SYMBOLS

- Water province boundary
- Salt body boundary
- Basin or area boundary
- Generalized direction of ground-water movement
- Aquifer boundry; dashed where assumed
- Boundry between confined and unconfined conditions; dashed and open where assumed (confined / unconfined)

□ Individual well location (or spring where indicated); letter stands for main water bearing formation tapped where known:

C = Coconino Ss.
K = Kaibab Ls.
M = Martin Fm.
Mo = Moenkopi Fm.
Mu = Muav Ls.
N = Naco Fm.
S = Supai Gr.
Sh = Shinarump
SR = Supai and Redwall
R = Redwall Ls.

Open symbol indicates no quality data

Colored symbol indicates level of TDS

GROUNDWATER AREAS AND ABBREVIATIONS

AGF = Agua Fria basin
ALT = Altar Valley
ARA = Aravaipa Valley
AVR = Avra Valley
BIC = Big Chino Valley
BIS = Big Sandy Valley
BWM = Bill Williams
BLM = Black Mesa
BRB = Black River basin
BOD = Bodaway Mesa
BUT = Butler Valley
CDI = Canyon Diablo
CHV = Chevelon
CHN = Chinle
COP = Coconino Plateau
CHI = Colorado River, Hoover Dam to Imperial Dam
CON = Concho
DOU = Douglas basin
DUN = Duncan basin
GIL = Gila Bend basin
GRD = Gila River drainage from Painted Rock Dam to Texas Hill
GSK = Gila River from head of San Carlos Reservoir to Kelvin
GTD = Gila River from Texas Hill to Dome
GWA = Grand Wash
HAR = Harquahala Plains
HAS = Hassayampa basin
HOL = Holbrook
HOP = Hopi
HOU = House Rock
HUA = Hualapai Valley
KAI = Kaibito
KAN = Kanab
LIC = Little Chino Valley
LHA = Lower Hassayampa
LSP = Lower San Pedro basin
LSC = Lower Santa Cruz basin
LVR = Lower Verde River
MMU = McMullen Valley
MNV = Monument Valley
N-C = New River-Cave Creek
PSC = Peach Springs Canyon
PRZ = Puerco-Zuni
RAN = Ranegras Plain
SAC = Sacramento Valley
SAF = Safford basin
SRV = Salt River Valley
SBV = San Bernardino Valley
SFP = San Francisco Peaks
SFR = San Francisco River basin
SSI = San Simon basin
SSW = San Simon Wash
SHV = Shivwits
SNO = Snowflake
STJ = St. Johns
TON = Tonto basin
TUB = Tuba City
USR = Upper Salt River basin
USP = Upper San Pedro basin
USC = Upper Santa Cruz basin
VER = Upper Verde River
VRG = Virgin River
WAT = Waterman Wash
WMD = Western Mexican drainage
WHM = White Mountains
WRB = White River basin
WIL = Willcox basin
WMN = Williamson Valley
YUM = Yuma

10 0 10 20 30 40 Miles
0 0 10 20 30 40 50 Kilometers

PLATE I

TOTAL DISSOLVED SOLIDS CONTENT OF AQUIFERS OF THE BASIN AND RANGE AND THE C-AQUIFER

Prepared by the Department of Water Resources in cooperation with the Arizona Department of Health Services

under a grant from the U.S. Environmental Protection Agency

Compiled by Debra Daniel